The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 11. MARCH 15, 1941. VOL. 53.

"PINING" IN LAMBS ON PERMANENT PASTURE IN N. WALES

An Investigation into the Cause of the Condition

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The influence of intestinal nematodes upon the causation of "pining" in lambs in N. Wales has been discussed previously (Rowlands 1940), (Roberts and Williams 1940), when the condition, as met with locally, was defined. The clinical condition as it occurs in weaned lambs on permanent lowland pastures was described in the papers referred to and it was tentatively concluded (Rowlands, 1940) that the problem in N. Wales would ultimately prove to be one of nutrition having a direct influence upon an otherwise adequate resistance of the sheep to the effects of parasitic worms.

Owing to the great immediate importance of "pining" in relation to the food production campaign, investigations into its cause were extended this summer, and embraced two farms (Centres 1 and 2) in a district of some 2,000 acres where sheep farmers meet with the problem every year to a varying degree, together with the College Farm, Aber (Centre 3). The results obtained, while they cannot be claimed to elucidate the cause of "pining" completely and can serve only as a basis for further work, do present certain features of interest and, it is thought, of importance. It is not intended to present the results obtained in any great detail here but to discuss those which appear of outstanding significance at the moment. In more favourable times it is hoped to publish the complete results of these observations, together with those of future work.

EXPERIMENTAL

Because of the parasite-nutritional view of the problem previously held, both aspects were deemed worthy of investigation. Our own work and that of others* has left no room to doubt the high efficiency of phenothiazine as an anthelmintic in sheep and because of the rather anomalous results obtained last year with copper nicotine sulphate, the former was regarded as the anthelmintic of choice. The connection of trace elements with the "pining" problem has been noted in other parts of the country and it was considered that the nutritional aspect of the problem should be investigated from this point of view. A mixture of iron, copper, cobalt, manganese and iodine was used.

Seventy lambs were weighed, individually marked, and finally divided into three approximately equal groups at each centre.

*See *Veterinary Record*. **52**. 635-665.

Group A received phenothiazine at intervals of a fortnight commencing with a dose of 10 gm. and rising to 20 gm.

Group B received at the same intervals doses of 10 c.c., rising to 15 c.c., of the following trace element mixture: iron 84 mg., copper 42 mg., cobalt 14 mg., manganese 42 mg., iodine 1·4 mg. per 10 c.c.

Group C consisted of untreated controls.

In the case of Centres 1 and 2, the lambs were cross-bred, sucking lambs, born and reared on the pastures. At Centre No. 3, the lambs were weaned Welsh mountain lambs approximately three months old and placed directly off the mountain on to the experimental plots [(*a*) 30 on an *old* pasture and (*b*) 40 on a moderately *young* pasture, laid down twelve years previously] on which a fairly heavy ewe population had grazed earlier in the year. The observation continued to the stage at which the farmer was able to sell for slaughter the lambs responding to treatment. A proportion of the remainder were slaughtered at the same time in order to get an exact comparison.

The results were different but significantly important at each centre. Briefly, they indicate that at Centre 1, treatment with trace elements and phenothiazine each permitted a greater live weight increase than was noted in the controls. At Centre 2, while trace elements allowed an outstanding increase over controls, phenothiazine failed to do so, whereas at Centre 3, the position was reversed. The results are set out in Table 1.

TABLE I

Showing the average weight increases of groups of lambs dosed with (a) Phenothiazine or (b) Trace Elements as compared with undosed controls. Totals of 70 lambs were observed at each of three centres.

Centre.	Period.	Phenothiazine.	Trace Elements.	Controls.
1	9/7/40–17/9/40	11·4	10·9	6·1
2	26/6/40–16/9/40	5·3	17·0	5·3
3a	22/7/40–11/10/40	15·8	9·4	8·1
3b	22/7/40–11/10/40	14·9	8·6	10·1

The effect of ***phenothiazine*** upon the nematode population was observed by worm counts and differential species counts (i) on five representative lambs from each centre before the experiment, and (ii) on five lambs in each group at centres 1 and 2 and on all 70 lambs at Centre 3, at the close of the experiment. In addition, periodical worm egg counts were made of composite faeces samples taken from a representative number of lambs in each group. Taylor's (1934 and 1939) methods were used for both worm counts and worm egg counts. The results are summarised in Table No. 2.

TABLE III

Showing the average gains in weight over a period of six weeks, in three groups each of ten lambs dosed with (a) copper, (b) cobalt, (c) manganese at weekly intervals. The lambs used were controls from the main experiment and some showed clinical evidence of pining prior to dosing.

Group.	Average gain (6 weeks).
Copper ...	1·1 lb.
Cobalt ...	7·4 lb.
Manganese	2·3 lb.

TABLE II

Showing (1) the degree of nematode infestation prior to and following the dosing of groups of lambs (A) with Phenothiazine, (B) with Trace Elements as compared with (C) untreated controls and (2) the worm egg counts of the same during the course of the observations. The figures recorded are for three centres in North Wales on the third of which two pastures were used.

Centre.		Worm Count (Abomasum).				Worm Count (Intestine).				Faeces—Worm Egg Counts (eggs per gramme).		
			After dosing.				After dosing.					
		Before dosing.	Group A.	Group B.	Group C.	Before dosing.	Group A.	Group B.	Group C.	Group A.	Group B.	Group C.
1	Range	300–2,600	0–400	0–500	0–900	0–10,100	0–200	0–100	0–2,900	100–250	150–300	200–1,500
	Average	920	116	175	320	2,580	33	25	600	110	230	740
2	Range	100–1,000	0–	0–1,600	200–1,500	200–5,500	0–200	200–1,900	0–1,000	0–1,100	100–800	300–800
	Average	440	0	460	580	2,020	40	680	420	175	350	600
3a	Range	0–400	0–100	400–5,600	100–10,400	0–900	0–100	800–11,300	500–16,600	0–400	200–1,700	0–3,100
	Average	160	10	2,080	2,630	440	20	4,530	2,730	110	1,060	1,450
3b	Range	0–400	0–1,500	400–3,100	300–8,100	0–900	0–6,600	600–10,200	200–23,200	0–200	0–1,100	100–1,700
	Average	160	175	1,540	2,100	440	960	4,670	5,610	100	720	1,000

The results clearly indicate the efficiency of phenothiazine in controlling nematode infestation. In the case of Centres Nos. 1 and 3b, the lambs were not killed for nearly three weeks after the last dosing; this it is thought may explain the higher counts seen in the phenothiazine treated group on these two pastures. The low worm counts in the trace elements group (B) at Centre No. 1 might be explained on the grounds that a corrected nutrition had prevented the establishment of worms.

It was found that *Ostertagia* spp., *Trichostrongylus* spp. and *Nematodirus* were the nematodes of greatest importance and that phenothiazine appeared to have successfully controlled infestations with each species. For the sake of brevity the detailed species counts are not recorded here.

The importance of ***trace elements*** at Centre No. 2 was so obvious that it was deemed advisable to investigate further which element was proving effective. Copper, cobalt and manganese were chosen and three groups of ten lambs (controls of the main experiment) were later dosed with each (copper 42 mg., cobalt 14 mg., manganese 42 mg.), at intervals of one week for six weeks. The lambs were weighed at the end of each fortnight. The results obtained are set out in Table 3.

The results suggested very strongly that at Centre No. 2 this year cobalt deficiency was the main (and perhaps the sole) cause of the "pining," but there is not sufficient evidence to show that the other elements included in the mixture (iron, iodine, etc.), did not have at least some effect. The beneficial effects of the trace element mixture were apparent to the farmer without actual recourse to weighing, the lambs showing marked clinical improvement throughout and this improvement was also seen in the cobalt treated group in the subsidiary experiment. For example, one very poor lamb was despaired of by the shepherd before dosing with cobalt, but actually gained 11 lb. in the six weeks and was obviously thriving at the end of the experiment.

DISCUSSION

No definite conclusions seem permissible as a result of the investigation but certain indications appear to be given. Thus, at Centre 3 (College Farm) it is seen that control of parasites was in itself sufficient to allow a weight increment far in excess of that of the controls and to prevent "pining." This is in keeping with our experience last year at this centre if we assume that the copper nicotine sulphate then used

acted as an anthelmintic and in no other manner. On the other hand, statistical examination of the results showed that no correlation existed between worm burden and weight increase in individual lambs (a point previously noted). It appears most difficult to reconcile these two facts. Nevertheless, the observation at this Centre demonstrates that by controlling light parasitic infestations it is possible to effect improvement in normal weight increase *even on young pastures*. This is a matter of the greatest immediate importance. Stewart and Ponsford (1936) associate "acute" pining in Northumberland with parasitic gastritis and indicate the presence of very heavy worm infestations in these cases. Such infestations were not noted in our experience with the exception of a few individual lambs which gave moderately high counts (abomasum, 10,000) but nevertheless continued to thrive.

The difference in the original worm infestations at the various centres is noteworthy. It may be that at Centre 3 the lambs were more susceptible to the effects of subsequent parasitic infestation, owing to a lack of a previously acquired immunity.

The importance of trace element deficiencies (iron, copper and cobalt) in the causation of "pining" has already received some attention in this country, and divergent views have been expressed as to their individual and general significance in this connection. The evidence presented by this investigation is perhaps slight, but points to the strong possibility that at one centre (No. 2) *cobalt* deficiency did, in fact, cause the "pining." This is particularly so in view of the light worm infestation (less than 1,000 worms in abomasum) and inability of an efficient vermicide to prevent the condition at this centre.

"Pining" embraces in its broad sense, nearly all conditions of chronic debility in sheep. The writers do not regard the "pining" under investigation as necessarily *identical* with that in other parts of the country, *e.g.*, Scotland, Northumberland and Somerset. Corner and Smith (1938, 1939) have particularly emphasised the importance of cobalt as the aetiological factor in the causation of pining in one part of Scotland without, however, investigating the possibility of other factors, *e.g.*, parasitism. Stewart and Piercy (1935), on the other hand, at first held the view that Northumberland pining was due entirely to intestinal nematodes, predominantly *Ostertagia circumcincta*. Later, Stewart and Ponsford (1936), the aetiology was explained further as being primarily a matter of general or specific malnutrition followed by an increased parasitic population, death finally resulting from actual clinical parasitic gastritis. Quite naturally, Stewart and Ponsford (1940) express surprise that Greig, Dryerre, Corner and Smith (1938) failed to observe the possible importance of parasitism, having dismissed this possibility on general grounds or on the unsatisfactory basis of occasional faecal worm-egg counts. Stewart and Ponsford (1940) further questioned the validity of the view expressed by Corner and Smith (1938 and 1939) that pining is due to a simple cobalt deficiency that can be cured by cobalt administration and set out to show that the view is untenable. Here they were able to indicate that ewes and hoggs affected with pining which was shown to be associated with a heavy worm infestation failed entirely to improve in condition when given a satisfactory cobalt supplement and in many cases actually died of pining. This is partially in keeping with our experience at Centre 3, though the worm infestation here was slight. They do not, however, assume from this result that it "excludes the possibility that a cobalt deficiency decreases initial resistance to worm infestation and thus might play a part in the production of pining."

The results at Centre No. 2 in the present investigation would appear to uphold the observations of Corner and Smith, since in the supplementary experiment, control lambs, which had gained an average of only 5·3 lb. in twelve weeks and which included some in very poor condition, were able to make a substantial gain of 7·4 lb. in six weeks when treated with cobalt as against 1·1 and 2·3 lb. in the case of the copper and manganese treated lambs respectively. It would be unwise, however, to assume from this that treatment with cobalt is likely to cure or prevent all cases of pining. Such treatment, for instance, would have been disastrous on the College Farm this year.

The results obtained at Centre No. 1 are of particular interest, suggesting either that the cause of pining is of a dual nature, parasites plus trace element deficiency (possibly cobalt) or that it is possible for both aetiological factors to appear at one and the same time and place. The former is the view regarded as being the more tenable and is in keeping with the observation of Stewart and Ponsford.

Blood analyses, which were undertaken on a representative number of lambs in the various groups before and after the experimental period, failed to show any outstanding abnormality.

The severity of "pining" in North Wales has been observed to be closely associated with rainfall. Symptoms of the disease are most marked in a season of low rainfall. The influence of rainfall may be twofold. It may influence the assimilation by herbage of trace elements which are present in normal amounts in the soil, or as is well known, it may influence the severity of parasitic infestations. It is not surprising, therefore, that the severity of "pining" is so closely connected with rainfall whatever factor is regarded as of prime importance in its causation.

The results point to the need for a further investigation into the possibility of a cobalt deficiency and parasitic infestation either alone or in combination as the cause of "pining." On this year's showing at Centre 1 and possibly 2 (where the rainfall was slightly lower than at Centre 3) the element of importance appears to be cobalt. On the other hand, it may be that another trace element will prove to be the one of significance, cobalt deficiency being in itself a disease entity and this possibility appears worthy of investigation.

Chemical analysis of the pasture at regular intervals revealed no nutritional deficiency of a general character, thus eliminating the possibility of general rather than specific malnutrition as being the basic cause of "pining."

A further point of interest is the possibility that the beneficial effects noted at Centre No. 3 following treatment with copper nicotine sulphate last year, when the worm counts in the treated were equal to those in the undosed lambs, might be explained on the basis of a cobalt contamination of the commercial copper sulphate employed. The writers are given to understand that the possibilities of such contamination

occurring are considerable. It is not inconceivable, therefore, that such treatment was effective by correcting a cobalt deficiency, the amount necessary being exceedingly small.

CONCLUSIONS

A few tentative conclusions appear reasonable and three possible explanations of the problem of " pining " as met with in North Wales seem to be suggested.

A : that " pining " is (i) a low-grade parasitic infestation readily prevented by regular dosing with an efficient anthelmintic (Centre 3) or is (ii) a cobalt deficiency which is avoided by a cobalt supplement (Centre 2). Both (i) and (ii) may occur together at one farm (Centre 1).

B : that " pining " is of a dual nature ; primarily a cobalt deficiency, later supplemented by a low grade parasitic infestation (Centre 1) ; that these two factors are liable to fluctuate violently to the complete suppression of either (Centres 2 and 3) but that *all* cases of " pining " in North Wales can be overcome at any time by the regular treatment with phenothiazine and a trace element mixture of the type used in this observation.

C : (i) that cobalt deficiency is a disease entity in itself, clinically indistinguishable from other types of " pining " in North Wales (Centre 2). (ii) That other forms of " pining " are due to a deficiency of a different trace element (X) which lowers the normal resistance of the lambs to the effects of low-grade parasitism (Centre 3). Thus this type of " pining " would respond both to anthelmintic treatment and to treatment with the trace element " X " which was presumably, not included in the mixture used in this experiment. The results at Centre 1 can only be explained on this view if it is assumed that both forms of pining (i) and (ii) existed there.

One cannot assume that wholesale treatment with phenothiazine on the one hand or trace elements on the other, is likely to prevent all cases of " pining " at all times. It is suggested, however, that treatment with a combination of the two will do so in most cases. In view of the extreme urgency of the problem to our present food production campaign it is thought fit to call immediate attention to this fact. It is recommended therefore that lambs on " pining " pasture be dosed at regular intervals of two to three weeks from June to October with phenothiazine and a trace element mixture such as that used in the experiment. Indeed, such treatment might well be beneficial even for lambs on pastures where clinical " pining " is not known to exist. Phenothiazine would eliminate the ill effects of low-grade parasitic infestations while the trace elements would correct deficiencies where they existed. A nation-wide policy of dosing would clearly save an enormous quantity of meat, while preserving much valuable supplementary foodstuffs. Such a policy would of necessity, be governed by the amount of available phenothiazine and the cost thereof ; the trace element mixture probably presents no difficulty and might even be supplied in the form of a mineral mixture in troughs.

Summary

(1) The results of an investigation as to the cause of " pining " on permanent pastures in North Wales are reported ; 210 lambs were used at three centres.

(2) The results are of statistical significance at each centre, indicating that pining was prevented :—

(*a*) By regular treatment with phenothiazine at one centre.

(*b*) By regular treatment with trace element mixture (probably cobalt) at another.

(*c*) By treatment with either phenothiazine or trace elements (possibly cobalt) at a third.

(3) The results confirmed the high efficiency of phenothiazine as an anthelmintic.

(4) There was no indication of a general malnutrition at any centre, a fact confirmed by pasture analyses.

(5) The results are discussed and it is considered to be untimely to assume that " pining " at every centre has an identical aetiology.

(6) Certain tentative conclusions are arrived at, indicating the possible nature of the causes of " pining."

(7) Attention is drawn to the benefits which might be gained by a policy of nation-wide dosing of all lambs at intervals of two weeks from June to October with phenothiazine and a trace element mixture (including cobalt).

Acknowledgments

This investigation was made possible by the receipt of a Grant from the Agricultural Research Council. The writers are indebted to Professor R. G. White, Head of the School of Agriculture and to their colleagues, Mr. W. McLean and Mr. E. J. Roberts, for their interest and assistance in this work. Dr. H. H. Green and Dr. E. L. Taylor of the Ministry's Veterinary Laboratory have also assisted in planning this work and have conducted certain blood analyses and larval counts. The Ministry of Food officials and certain slaughterhouse personnel at Rhyl, Abergele and Bangor afforded excellent facilities for obtaining *post-mortem* material and the farmers directly concerned with this observation co-operated in a whole-hearted fashion.

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Weekly Wisdom

Benevolence and Gratitude once found themselves at the gates of Heaven. St. Peter, believing them to have arrived together, welcomed them with a compliment on their joint effort on earth. " But," they replied, " this is the first time we have ever met."—Lloyd George.

* * * * *

Dogs of German pedigree are receiving extra rations in Belgium, says Inbel, the Free Belgian agency, quoted by Reuter. Rationing for dogs takes account of race and pedigree and consequently some are luckier than others. An Alsatian, with a German sire, has a right to 20 lb. of biscuits a month.

THE VETERINARY RECORD
March 15th, 1941.

THE CONTROL OF SHEEP DISEASES

WHEN one casts the mind back to the war of 1914-18 it is realised that in one respect, at least, we are now much better prepared. Then the veterinary profession paid little attention to disease conditions causing loss among sheep; now we are reasonably well armed to meet this menace to our food supply. While one would not ignore the pioneer work of men like M'Fadyean and Stockman, the progress since Gaiger's study of braxy commenced about 1920, through the period when liver fluke was brought under control and Dalling's brilliant work on lamb dysentery showed how this disease could be prevented, down to the present has been remarkable. This is undoubtedly largely the reflection of a new policy which created facilities for the study of veterinary problems, but it was fortunate that men who were prepared to devote their life to this work were at hand within the veterinary profession. These veterinary workers enhanced the reputation of the profession as the body in which men qualified and fitted to study sheep diseases were to be found. Probably greater danger of lack of recognition lay in the realm characterised by diseases in which the loss is less dramatic—some lack of thriving or loss of condition. "Pine" has now been studied in several localities in this country. Chemists have contributed much to these investigations, but it is fortunate that veterinary workers have been part of the teams. Greig, Lyle Stewart and the workers at the University College of North Wales, whose latest contribution appears elsewhere in this issue, have kept the profession well represented in these investigations. Where the veterinary mind has been directed to the problem it has not followed a narrow channel but applied itself to the study of the several factors which may play a part in the production of "Pine." Rowlands and Harbour in North Wales have shown that lack of "trace elements" may be the major, even the sole, cause of "Pine" on one farm, whereas on another, parasitism of the alimentary tract may be the important causal agent. In yet other flocks these two factors may work together to produce the lack of thriving or loss of condition.

The mention of intestinal parasitism in sheep recalls another outstanding example of the place made for the profession by a few of its members. Taylor's work in the field of helminthology has left its mark in agricultural and in scientific circles. It was largely through his initiative that the recent study of phenothiazine was undertaken in this country and the investigation pushed to the stage at which recommendations for the field use of this drug could be made.

The recently-published First Report of the Survey Committee of the Association has shown very clearly that the profession has the means to prevent the enormous losses which occur among dairy stock through the ravages of the major cattle diseases. What is now urgently required is an effective means of putting that knowledge into country-wide practice to conserve the nation's food supply. We believe that a quick survey of the sheep disease position would convince the powers-that-be that the position in the realm of sheep disease control is not dissimilar. Throughout the length and breadth of this land there exist flocks of sheep, varying from the thousands of the hillsides and mountain ranges to the cottar's score, many of which would benefit materially by the application of existing knowledge. Yet one cannot say that the exigencies of the present food position have stimulated those in authority to see that preventable loss among sheep is cut to the minimum.

We have the knowledge, we have the means, we have the men. What organisation will procure effective action? Should the veterinary profession, as represented by the N.V.M.A., again attempt to force the pace? If it does, would the other interested parties join in to ensure that we beat down wastage through sheep diseases?

CLINICAL COMMUNICATIONS

I.—A Noteworthy Abdominal Lipoma
II.—Inguinal Metrocele

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CASE I. *Subject.*—Dog, fox terrier, nine years old, weight 23½ lb.

Symptoms and History.—Inappetence, dullness, slight swelling of the abdominal wall was noticed; the swelling was fairly hard and the whole of the abdominal wall except the posterior third was tense, the tenseness being regularly distributed. Slight pain was exhibited on pressure. The breathing was somewhat laboured. The heart showed palpitation and the sounds were very loud. The pulse was 124, the temperature 103·2. There was no vomiting and the dog had regular motions. Swelling had been noticed only during the last fortnight.

Diagnosis.—A diagnosis of abdominal tumour was made, but the dog was given a week in order that progress might be watched, and to satisfy the owner.

Second Visit.—The swelling was a little softer. The dog had eaten a little now and then, and did not look very emaciated, nor would the presence of such a big tumour (as was ultimately found) be suspected. The swelling appeared more prominent when the dog was put on its back. No peristalsis could be heard.

Operation.—With the idea of removing the tumour, laparotomy was performed. After nembutal anaesthesia,

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a mid-line incision was made. A greenish-brown mass could be felt: this seemed to extend all over the abdomen, except to the extreme hinder part. From the size of the tumour it was deemed impossible to remove it, so the dog was destroyed on the table.

Post-mortem Findings.—A tumour about the size of a football bladder, arising from the mesentery, was found. It weighed 5½ lb. and was 10½ inches in diameter. It was lobulated and richly supplied with blood vessels. A part of the tumour was sent to the Royal Veterinary College, where Mr. E. G. White kindly examined it for us. It was found to be a lipoma with a fibrous capsule, in which haemorrhage had occurred and patches of necrosis at some places.

Remarks.—(*i*) The tumour weighs approximately one-fifth of the bodyweight.

(*ii*) In spite of so much pressure on the intestine, the dog had regular motions.

(*iii*) Laboured breathing and palpitation of the heart may be considered due to pressure on the diaphragm.

Case II *Subject.*—A nine-year-old bitch (mongrel). This animal was destroyed because of epithelioma of the tonsil. While doing the *post-mortem* examination a swelling was noticed on the left side of mammary gland. On cutting this it was found to be an inguinal metrocele, which included the two cornua of the uterus and the body of the uterus with some fat. It is very unusual to find two cornua of the uterus and the body, in a hernia.

The atrophied mammary gland and the cornua indicated that the dog had never been bred.

In the eradication of bovine tuberculosis in Canada, the Health of Animals Division, Dominion Department of Agriculture, continued its work on a large scale during the year ended March 31st, 1940. Altogether 1,674,891 tuberculin tests were conducted, 1,156,298 being under the Area Plan; 292,902 under the Accredited Herd Plan; and 225,691 under the Supervised Herd Plan. Approximately 40 per cent. of all cattle in Canada are under supervision and have been tested. There are over 1½ million cattle in accredited areas where infection has been reduced to a half of one per cent. or less.

ABSTRACTS

[THE SIGNIFICANCE OF THE "TRACE ELEMENTS" IN NUTRITION. Underwood, E. J. (1940.) *Nutr. Abstr. Rev.* **9.** 515-534. (231 refs.).]

At least 13 minerals are known to be essential to higher animal life. They are: calcium, phosphorus, magnesium, sodium, potassium, chlorine, sulphur, iron, copper, manganese, zinc, iodine and cobalt. The last five in this list have been termed "trace elements," since they function in such relatively small quantities. (Iron can no longer be regarded as a trace element, as it is required in comparatively much greater quantities). In addition to the elements known to be essential, arsenic, aluminium, rubidium, fluorine, silicon, barium and nickel are commonly present in various animal tissues and fluids, but whether they are physiologically essential, or are merely present accidentally, has yet to be ascertained. Still more elements have been from time to time demonstrated spectrographically, but the results of the various workers in this field have shown considerable variance, and it is not yet known with what degree of constancy such substances are to be found.

Copper (Cu). It is now established that Cu is essential for haemoglobin formation in the rat, rabbit, chicken, pig, lamb and dog; its function is concerned with the conversion of absorbed iron into haemoglobin and not with iron assimilation. Cu appears also to play a part in the oxidation-reduction enzyme systems of the cell.

There is little experimental evidence to indicate that Cu, as well as iron, therapy is of practical significance in the treatment of piglet anaemia, the reason probably being that the relative requirements for Cu are very small and are satisfied by the traces of the element present in the pens, food or iron salts provided. Similarly, the author is of the opinion that, even under restricted conditions, an actual Cu deficiency is unlikely to occur in laying hens which are receiving normal rations.

With grazing sheep and cattle, however, the position is very different, and in both species illnesses have been ascribed to a Cu deficiency. In 1933, Sjollema described the bovine disease known as "Lecksuche," characterised by anorexia, emaciation, anaemia and diarrhoea, and found that it responded to Cu therapy. Other somewhat similar conditions of both sheep and cattle have since been ascribed to Cu deficiency, but there is now evidence to suggest that they are predominantly cobalt deficiencies. Enzootic ataxia and "swayback" of lambs appear to be associated with pastures which are deficient in Cu, and respond to Cu therapy. [A number of papers on Cu, of importance to the veterinarian, had not appeared in print at the time when this review was prepared, but abstracts of some of them have already appeared in the *Veterinary Record.*]

Cobalt (Co). A few years ago, "Denmark disease" or "enzootic marasmus" in Western Australia, "bush sickness" in New Zealand, "salt sick" in Florida, "pine" in Scotland, and "nakuruitis" in Kenya were all believed to be iron deficiencies, because they could be prevented and cured by salts and minerals containing iron. In the case of "enzootic ataxia," the dosage of iron necessary appeared, however, to be excessively large, and from this and

other facts it was suggested that the responsible agent was present in traces in the iron salts employed. By various fractionations, it was eventually shown that Co was the active substance, and Filmer and Underwood were able to maintain animals in normal health, while grazing on " unsound " pastures, by daily doses of 0·1 mg. Co in the case of sheep, and 0·3 mg. in the case of cattle. In South Australia, the " coast disease," which is peculiar to the calcareous littoral of that region, has likewise been shown to be, at least in part, a Co deficiency. It appears, however, that Cu therapy is also necessary in order to cure the anaemia accompanying the disease and to restore the animals to health. In New Zealand, " bush sickness " has now been successfully prevented by small doses of Co, and it has also been reported by various workers that " salt sick," " pine " and " nakuruitis " are all amenable to Co therapy. [Readers of the *Veterinary Record* will be familiar with the fact that opinion as to the aetiology of " pining " in sheep is somewhat strongly divided.] Horses appear to thrive in the areas in which ruminants tend to suffer from Co deficiency, and there is no record as yet of any Co deficiency in pigs. In both rats and dogs the addition of relatively large doses of Co to the diet is followed by a polycythaemia, although the evidence is less clear cut in the case of the dog. One worker has claimed that the administration of whole liver to dogs rendered polycythaemic with Co reduces the number of red blood corpuscles to normal in two to four days.

Nickel (Ni). This element has been found to be of fairly widespread occurrence in both plant and animal tissues, but no animal experiments definitely establishing its significance have yet been carried out.

Manganese (Mn). The most significant studies of Mn metabolism have been made in connection with the diseases of fowls known as " perosis," or " slipped tendon," and as " chondrodystrophy." " Perosis " is a leg disorder characterised by gross enlargement and malformation of the tibio-metatarsal joint, accompanied by a displacement or " slipping " of the gastrocnemius (Achilles) tendon from its condyles ; it occurs most frequently in young battery-fed birds, and is known to be aggravated by high intakes of calcium and phosphorus. Although it is not certain that Mn is the only factor involved, this element is now known to be essential for its prevention. *In vitro* studies have indicated that Mn activates the enzyme phosphatase, whereas calcium and phosphorus depressed its activity ; in perosis, the phosphatase activity of the blood and bones is much lower than normal.

The condition known as " chondrodystrophy " occurs in the embryos of eggs from hens receiving perosis-producing diets : it is characterised by short thickened legs and globular heads. The addition of Mn to the diet of the hens, or the injection of Mn into the eggs, is held to prevent the condition.

It has been suggested by Carlström and Hjärre that susceptibility to infectious anaemia of horses on certain Swedish pastures is indirectly associated with the high Mn content of these pastures. These workers have further claimed that yeast reduces the susceptibility, and therefore suggest that an abnormally high intake of Mn produces a vitamin B deficiency.

Zinc (Zn). Early attempts to demonstrate that Zn was a dietary essential were hampered by a lack of knowledge of the various vitamins, but more recently the need of the rat for Zn has been shown by the Wisconsin school, who have found very inferior growth rates in animals receiving only minute traces of this element in their diet. An interference with the growth of fur was the only other effect noted, and so far there have been no indications of a Zn deficiency amongst either human beings or farm animals under natural conditions. A comparatively high concentration of Zn is to be found in milk. [A very recent paper, that of D. Keilin and T. Mann, 1940, *Biochem. J.* **34**. 1163-1176, indicated that Zn is present in purified preparations of the enzyme carbonic anhydrase ; this finding, in the authors' own words, " establishes for the first time the physiological function of this metal in organisms."]

Arsenic (As). It has long been known that traces of As occur regularly in plant and animal tissues, but it is as yet undecided whether it is an essential component. Marine products, particularly shell fish and crustacea, have been shown to contain from ten to 100 times as much As as foodstuffs grown on land, while cod liver oil has been reported as containing from 1·4 to 3·3 p.p.m. of As. There is a rise in the As content of the blood of normal women during menstruation, and an even more marked rise during the fifth and sixth months of pregnancy. It has recently been reported that As has the property of preventing selenium intoxication.

Fluorine (F). This element has been of very considerable interest on account of its toxicity, but it has long been supposed that it is an essential element in nutrition. This supposition has probably arisen from the fact, first demonstrated at the beginning of the 19th century, that F is constantly present in the bones and tooth-enamel, as well as in other tissues. However, all attempts to induce an impairment of health by feeding a diet low in F have failed, and it is stated that " if the rat requires F at all, its requirement must be less than 2 γ* per day.

Bromine (Br). Many papers have been published to discuss the significance of Br, which is a normal plant constituent and which appears to be constantly present in the blood. " The weight of evidence at present, however, is that the presence of Br in the body is simply fortuitous, and dependent upon food intake. The comparatively large quantities sometimes discovered in the blood (50 to 100 times that of I) and tissues is apparently due to a combination of high intake and slow rate of excretion of this element. A study of the effects of a diet free from or very low in Br has not, so far as is known, been attempted."

Aluminium (Al). There is no evidence to indicate that Al is a dietary essential. In the case of the rat, the requirement, if any, appears to be less than 1γ* per day.

Silicon (Si). The universal distribution of Si in soils and in the dust of the atmosphere makes it probable that it is a constant constituent of all plant and animal tissues. This element plays a significant part in the nutrition of higher plants, but it remains to be shown whether it has any physiological role in the higher animals.

A. N. W.

*γ is sign used for " gamma " (*i.e.*, 1 microgramme).

[ASPIRATION OF PLANT MATERIAL BY YOUNG CALVES AND THE RESULTING TISSUE CHANGES IN THE LUNGS. White, E. G. *J. Path. Bact.* **51.** 458-460.]

Three out of sixteen young calves used in experiments on tuberculosis showed, on *post-mortem* examination, fragments of plant material, chiefly linseed, in the alveoli and small bronchi. These were associated with localised inflammatory changes and abscess formation with the presence of *C. pyogenes*, the lesions resembling those often seen in calf pneumonia.

These calves may have aspirated this material during bucket feeding with a milk substitute or from dry meal, both of which contained linseed.

The possible practical significance in regard to calf pneumonia is indicated.

Detailed histology and photographs of lesions are given.

J. A. L.

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[A STUDY OF THE MORTALITY RATES OF CALVES IN 335 HERDS IN ENGLAND AND WALES (TOGETHER WITH SOME LIMITED OBSERVATIONS FOR SCOTLAND). Lovell, R., and Bradford Hill, A. (1940.) *J. Dairy Res.* **11.** 225-242.]

A statistical study of calf losses in 335 herds in England and Wales and 47 herds in Scotland. All had a relatively high standard of hygiene. The figures given are mainly those of female animals as the post-natal losses in bull calves were difficult to assess owing to early disposal. In all 27,970 pregnancies were recorded and 14·3 per cent. failed to produce a calf still living at six months. The losses were distributed as follows: 5·5 per cent. abortions, 4·4 per cent. stillborn and 5·5 per cent. of post-natal deaths. Stillbirths and abortions showed no seasonal variations but post-natal deaths were greater in the spring than in the autumn. This effect was greater in Scotland than in England and Wales. There was no significant difference in the death rates as between large and small herds.

There was evidence from the mortality statistics that there is an advantage in allowing calves to take colostrum naturally, but the mortality was not increased if bucket feeding with either undiluted or diluted milk was substituted. Nearly half the post-natal deaths occurred during the first week of life and it is thought that "white scours" was probably an important cause of loss.

P. S. W.

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[THE EFFECT OF VARIATIONS IN THE FAT PERCENTAGE AND IN THE REACTION (pH) OF MILK MEDIA ON THE HEAT RESISTANCE OF CERTAIN MILK BACTERIA. Nichols, Agnes A. (1940.) *J. Dairy Res.* **11.** 274-291.]

Preliminary studies were made with spores of nearly forty strains of aerobic spore-forming organisms from milk products. Despite considerable variations in individual strains, *B. subtilis* showed the greatest heat resistance. Exposure to 120° C. for 20 minutes (conditions comparable with commercial canning) did not destroy spores, while some strains withstood this temperature for 50 minutes. Two highly resistant and one less resistant strain of *B. subtilis* associated with cream spoilage were used in further studies. The results indicate that departure from the *p*H zone 6·6 to 6·8 tends to decrease heat resistance. The fat content of the substrate does not appear to have a significant effect. Parallel studies on non-spore forming organisms (*Bacillus coli*, Streptococcus) also gave no support to the theory that a substrate of high fat content favours survival of organisms during heat treatment.

J. B. B.

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[SPONTANEOUS UTERINE AND MAMMARY TUMOURS IN THE RABBIT. Burrows, H. (1940.) *J. Path. Bact.* **51.** 385-389.]

Of 25 female rabbits kept in the laboratory for over two and a half years 15 showed uterine tumours, and of these three also had mammary tumours. The uterine tumours started with what appeared to be a cystic glandular hyperplasia of the mucosa.

Progestational changes in uterine mucosa, pseudo-pregnancy, cystic mammary enlargement, ovarian enlargement and often complete luteinisation were all frequently noted.

In discussion the author suggests that the uterine and mammary tumours may have been caused by ovarian hormone owing to the similarity between some of the changes and those produced by oestrogens.

The possibility of the frequent pseudopregnancy having some bearing on the conditions is mentioned but not discussed.

[The reasoning appears paradoxical in many points.]

J. A. L.

REPORT

[ALAN, DUKE OF NORTHUMBERLAND MEMORIAL FUND: Seventh Report of the Management Committee.]

This Report follows the lines of those which have preceded it.

There is a note on the concessions which are available to subscribers in the provision of biological and other products at prices which are claimed to be 25 to 33 per cent. cheaper "than formerly." This probably does not mean that there has been a general reduction in the price of these products, but rather that through this organisation they may be obtained at prices considerably below those ruling in the open market. It is interesting to note that there is a sub-heading to pulpy kidney disease, namely, "Turnip Sickness" in Hoggs. Although no account of further work on this problem is included in the research section of the Report, it is evident that *Cl. welchii* type D. entero-toxaemia has been found to exist in store sheep in the autumn and winter—presumably those being fattened by folding on a turnip crop. The research section of the Report, in non-technical language, covers a wide field. Most of this work has already appeared in technical articles from the Newcastle team of workers. It is of particular interest to note that grass sickness in horses is to become a major subject of investigation in this Province.

Mr. Lyle Stewart and his co-workers are to be congratulated on the production of a Report which cannot fail to stimulate the agriculturalists in the four northern counties of England to a greater interest in the control of diseases of sheep.

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Mar. 15th.—Annual General Meeting of the North of England Division, N.V.M.A., at King's College, Newcastle-upon-Tyne, 11.15 a.m. Annual Luncheon in the University Union, 1.15 p.m.

Mar. 19th.—Meeting of the Midland Counties Division, N.V.M.A., at Stafford, 2.30 p.m.

Mar. 20th.—Annual General Meeting of the Mid-West Division, N.V.M.A., at Bristol, 2.30 p.m.

Mar. 20th.—Extraordinary General Meeting of the Central Division, N.V.M.A., at the Conway Hall, W.C.1, 3 p.m.

Mar. 21st.—Fifty-seventh Annual General Meeting of the Southern Counties Division, N.V.M.A., at Salisbury, 2.30 p.m.

Mar. 22nd.—Annual Meeting of the Scottish Metropolitan Division, N.V.M.A., at the Royal (Dick) Veterinary College, Edinburgh, 11 a.m.

Mar. 26th.—Fifty-seventh Annual General Meeting of the Western Counties Division, N.V.M.A., at Exeter, 2 p.m.

Mar. 26th.—Meeting of the Lancashire Division, N.V.M.A., at Preston, 2.15 p.m.

Mar. 28th.—Meeting of the Sussex Division, N.V.M.A., at Brighton, 2.30 p.m.

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National A.R.P. for Animals Committee

NOTIFICATION OF CHANGE OF PERSONNEL

The Chief Executive Officer would welcome notification of the change of addresses of veterinary surgeons assisting N.A.R.P.A.C. and of a change in veterinary personnel when assistants move from one practice to another. Without this information the records at Headquarters are apt to become misleading.

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PERSONAL

Birth.—To Jean, wife of F. A. Byrne, M.R.C.V.S., Elmwood, Lode Lane, Solihull, near Birmingham—a son.

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Marriage.—PETTETT—THURSTANS.—On March 1st, at St. Gabriel's, Plymouth, Dudley Pettett, M.R.C.V.S., to Ina Thurstans, both of Plymouth.

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Students' Retirement Presentation to Professor O'Connor.—On the evening of February 20th the students of the Veterinary College, Ballsbridge, Dublin, made a presentation to Professor J. J. O'Connor on the occasion of his retirement as Principal of the College.

Mr. Simon Kavanagh, President of the Students' Union, who made the presentation, expressed on behalf of the students their sincere appreciation of the great work done for the College by Professor O'Connor during his tenure of office both as Professor of Surgery and Animal Husbandry and as Principal. His book on veterinary surgery, which is issued as a textbook, not only here, but throughout the English-speaking world, would remain as a monument to his worth. His leaving the College removed the last link of the College's origin, for he was there when it started and had seen it through all its ups and downs ever since. To-day the College was being brought into line with the most modern European colleges, a project for which he was in no small way responsible.

Professor O'Connor, in reply, thanked the students for the tributes paid to him, and said the presentation would serve as a lasting souvenir of the happy days he had spent in the College, where there was always a splendid spirit of good fellowship.

R.C.V.S. OBITUARY

MACARTHUR, James, O.B.E., Leighton Buzzard, Beds., Lt.-Col. R.A.V.C. (T.A.) Reserve. Graduated December 21st, 1894. Died February 28th, 1941, aged 65 years.

HUDSON, John William, Wellington Place, Spital Hill, Retford, Notts. "Existing Practitioner." Died March 2nd, 1941, aged 81 years.

THE LATE LIEUT.-COLONEL JAMES MACARTHUR, O.B.E., J.P., M.R.C.V.S.

Colonel Macarthur's sudden death, which we record with much regret, was a most painful surprise to his many friends in Leighton Buzzard and district, as he had appeared to be in robust health. He went to Mentmore to attend the foaling of a mare, and he died whilst at work.

In a tribute to him, the *Leighton Buzzard Observer* states that Colonel Macarthur had been one of the town's best known residents for 30 years and his genial disposition and wise counsels had won for him a host of friends.

The memoir proceeds: "A native of Connaught, Ireland, Col. Macarthur practised as a veterinary surgeon in Essex before going to Leighton Buzzard to take over an old-established practice which covered a large area in Beds and Bucks. A few years later the Great War broke out and he rejoined the Essex Yeomanry. He was transferred to the famous 4th Irish Dragoon Guards and eventually became Officer Commanding the 14th Veterinary Hospital of the British Expeditionary Force, which carried with it the rank of Lieutenant-Colonel.

"When he returned to civil life, Col. Macarthur became a member of Leighton Buzzard Urban District Council, and served the town for two periods. He was a clever debater and he threw all his skill into the fight which went on for some years to prevent the early and unsound Government housing schemes being thrust upon Leighton Buzzard. These efforts ended in the town's housing schemes being delayed until cheaper and more satisfactory houses could be built. He gave up his seat on the Council when he became veterinary inspector to the three local councils.

"He was mentioned in dispatches in 1918, and made an Officer of the Order of the British Empire in the same year.

"He took a great interest in ex-Service men, and he helped the British Legion to obtain the use of the Town Hall as a clubroom.

"When the national appeal was made for Home Guard defenders, Col. Macarthur was appointed Officer Commanding the Leighton Buzzard and District Company. He took a keen interest in this work and there was general regret among the members when pressure of other duties forced him to give up the command.

"He was made a Bedfordshire Justice of the Peace in 1936 and had since sat regularly at meetings of the Leighton Buzzard Bench of magistrates.

POLITICAL AND PROFESSIONAL WORK

"Col. Macarthur was widely known in political circles. A keen Conservative, he had taken an active part in every local Parliamentary contest since the last war, and his efforts did much to help Mr. Max Townley to wrest the newly-formed Mid-Beds seat from Sir Arthur Black, and later to help Gen. Warner to defeat Mr. F. C. Linfield. He was also a prominent figure in Mr. A. T. Lennox-Boyd's victories in two successive elections—a Conservative record for the division. Col. Macarthur presided over many of Mr. Lennox-Boyd's election meetings, and his quiet manner and dry humour did much to maintain order when the meetings might have got out of hand. For some time he had been Vice-Chairman of the Mid-Beds Conservative and Unionist Association.

"Col. Macarthur also supported most of the local public charitable organisations in Leighton Buzzard and took an active part in the local effort to raise £5,000 for purchasing a Spitfire aircraft. He was a member of the organising committee.

"As a veterinary surgeon Col. Macarthur ranked high. He was an exceptionally good judge of horses and their

ailments, and he was frequently called to distant parts of the country by hunting and other clients needing his skill. For many years he made frequent visits to Ireland, and like the late Mr. Owen C. Wallis, of Leighton Buzzard, he was a prominent figure at the Dublin Horse Shows.

"Quite apart from his official and professional duties and public work, Col. Macarthur had a very wide circle of friends and acquaintances. He had had an extensive experience of men and things, on which he drew freely and readily. Possessed of a very retentive memory, he was an excellent raconteur, and many of his stories were very humorous. A chat with him was always a mental stimulus, for his comments on events were lively and sometimes incisive. Added to these qualities was an abounding geniality which made him welcome everywhere, and a reluctance to wound the feelings of anyone. It is no exaggeration to say that hundreds of people in Leighton Buzzard and district will feel his loss keenly and will long remember his cheery greetings."

Colonel Macarthur is survived by Mrs Macarthur, a son and a daughter, to whom we extend deep sympathy in their bereavement.

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HORSES IN CHEMICAL WARFARE

Demonstration of an Efficient Respirator

A demonstration of respirators for horses was given at the Royal Veterinary College, Camden Town, on Wednesday of last week, before a representative gathering of horse owners and others interested, among whom was Brigadier Charles Murray, the Director of Veterinary Services and Remounts.

The demonstration was conducted by Major Bamford, O.B.E., M.R.C.V.S., R.A.V.C., who has devoted considerable study to the subject and carried out exhaustive tests on the comparative merits of various types of masks for horses, for the designing of which he has been largely responsible.

The respirators on demonstration were Mark I and II, Mark I being a part two way breathing bag of the humid filter type. It fits over the nose and upper jaw, the lower jaw remaining free and, therefore, the bit need not be removed when putting on the respirator. Normally, a horse does not inhale by the mouth and any saliva containing war gas which may be occasionally swallowed is unlikely to cause serious harm. The bag proper is essentially a large filter composed of a light packing material, *viz.*, cotton towelling, which is arranged in various layers, each layer being impregnated with a chemical chosen to remove war gases.

Two expiratory valves are provided and the gas-tight fit is obtained by means of a sponge rubber fitting band made in four sizes; the respirator weighs 4¼ lb. and with haversack 5¾ lb.

Compared with the charcoal box type respirators issued to the public, this respirator has a short service life. Replacement in the field will probably involve a new issue—although certain components can be recovered for use again.

It is not suitable for wearing for long periods in hard work because the service time would be seriously reduced by the greatly increased air flow through the filtering material.

Some deterioration takes place during wear even when no "gas" is present in the atmosphere. After six hours' continuous use at light exercise, the respirator still affords protection.

Training is necessary to enable the man expeditiously to put the mask on the horse, especially when he is encumbered with his own respirator: training is also necessary to accustom the horse to tolerate the mask. A daily five-minute exercise for ten days to a fortnight should prove sufficient.

The respirator is furnished with adjustable straps which terminate in a metal hook. The straps and hooks suspend the respirator from the brow-band of the bridle, while an additional strap is provided to pass round the lower jaw to hold the respirator in place. The straps require careful adjusting for each individual animal, to avoid loss of time in putting on the respirator in an emergency.

The mask is put on the horse by inserting the hand into the interdental space, causing the animal's mouth to open. With the right hand the respirator is slipped over the upper jaw, and suspended from the brow-band of the bridle by means of the metal hook. When both man and horse are accustomed to the operation, the respirator is speedily fitted.

Mark II is a dry filter type consisting of a simple filter of esparto containing charcoal. The respirator is furnished with similar suspension straps and hooks as Mark I, and is similarly adjusted, and animals wearing it can be subjected to more strenuous work.

This Mark II respirator is not yet in commercial production, but it is considered to be more effective than Mark I, has a longer life, and even after use in high concentrations of gas it is only necessary to change the filter, a simple operation as the filter is held in a metal container.

Three animals were used for demonstration, a heavy draught, a light draught, and a cob, none of which had hitherto been fitted with these appliances. The horses showed no restlessness or resentment either during the process of fitting or in wearing them.

Both inspiration and expiration were, of course, accelerated and deepened, but this was to be expected. This is a feature inseparable from the use of respirators and one which usage does much to remedy.

The horses were walked and trotted and showed no sign of distress and little discomfort.

Celluloid eye shields and body covers were also demonstrated simultaneously with the mask.

After the demonstration, Major Bamford gave a short discourse on the details of the masks, illustrated with lantern slides, and made some pertinent observations in connection with some of the gases and their effects on horses.

A useful discussion followed and Major Bamford replied informatively to many points raised.

The question of the decontamination of the horse was raised, and it was suggested that should funds be made available, a model plant be installed at a convenient centre, manned by a small trained staff, where all entrusted with the care of horses could receive instruction in the proper procedure. With a trained staff always in attendance, demonstrations could be frequently carried out for the information of those desirous of acquiring knowledge of decontamination. Horse owners would then be able to make their own local arrangements in accordance with their requirements.

At the conclusion of the discussion the hope was expressed that similar demonstrations would be given at various centres throughout the country.

Both the demonstration and the discussion created a great deal of interest amongst all present and at its close Colonel R. J. Stordy, Chief Executive Officer of N.A.R.P.A.C., who had arranged the demonstration through the Ministry of Home Security and who presided over the subsequent discussion, thanked Major Bamford and his personnel and complimented him and the staff of the Design and Munition Department in providing adequate protection for the horse, a problem which hitherto had appeared insurmountable.

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VETERINARY SERVICES IN TASMANIA

In forwarding the cutting from the Tasmania *Examiner* reproduced herewith, Lieut.-Colonel Wakefield Rainey, C.B.E., M.R.C.V.S., writes: "The item of news I enclose is the first instance of a real effort to nationalise veterinary services in an English-speaking country. Having recently joined the agricultural organisation here as a veterinary officer of the animal health section I have

been able to help in this innovation and hope to go on helping until the scheme has fully fructified. The chief veterinary officer in Tasmania, Philp by name, began the veterinary service here 25 years ago alone—as the first and only veterinarian in Government employ. He has built up so excellent an organisation and has so fully won the confidence of the Government and the farmers that his proposal for nationalisation was accepted without question."

Following is Colonel Rainey's enclosure:—

"Veterinary services in Tasmania are to be nationalised, announced the Minister for Agriculture (Mr. D'Alton). The scheme of nationalisation would be governed by the following principles, said the Minister: Existing services to be used and extended to embrace attendance on private cases; additional assistance to be obtained for areas where the services at present were regarded as inadequate; and the services to be made available to animals of economic value to the State, a moderate scale of fees to be drawn up for attendance on private cases.

"Tasmania had led the way in a number of reforms, said Mr. D'Alton, and the proposed scheme would minimise the difficulties of providing skilled attendance and should bring about a service to farmers which would not be equalled in the whole of Australia. The benefits would far outweigh any expenditure incurred.

"It was proposed to increase the present staff and steps had already been taken to secure an additional veterinary officer so that veterinary officers could be stationed at Smithton, Burnie, Devonport, Launceston, Scottsdale and Hobart. Steps were being taken also to secure graduates after the next final examination to further augment the staff. When these were obtained there would be a further decentralisation of veterinary officers.

"It could not be denied, he continued, that there was a considerable economic loss through the want of skilled attention to ordinary accidents and diseases in animals. The Department of Agriculture's staff as at present constituted was not large enough to give the needed attention outside. It seemed an anomaly that veterinary officers in the course of their ordinary duties might investigate a case where a few sheep had died, representing a loss of perhaps £3 to £4, whereas they did not attend to a case of colic in a horse worth £40 to £50.

"The additional expense of the proposed scheme would not be large, and such expenses would be met largely by a system of payment by stockowners for attention in private cases."

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THE FOOT-AND-MOUTH DISEASE POLICY OF THE MINISTRY OF AGRICULTURE AND FISHERIES

As our readers are well aware, several letters have recently been published in *The Sunday Times*, *The Times* and other newspapers expressing dissatisfaction with the present slaughter policy of the Ministry of Agriculture for dealing with outbreaks of foot-and-mouth disease.

The following letter, which is reproduced from *The Sunday Times* of March 9th last, provides the official reply to this correspondence:—

To the Editor, *Sunday Times*

From the Rt. Hon. R. S. Hudson, Minister of Agriculture and Fisheries.

Sir,—The letters which have appeared recently in the Press directed against the official slaughter policy for foot-and-mouth disease call for a brief statement to correct many false impressions which those letters may have created in the public mind. It would be impossible to deal in a letter with all the points advanced by the critics of the policy, and I will, therefore, confine myself to the more important considerations as I see them.

(1) It is not suggested that foot-and-mouth disease is a "killer"; for the most part animals recover naturally and without the assistance of any cure, but admittedly it reduces the milk supply considerably and affects the output of meat owing to the general loss of condition in adult stock; in very young stock the mortality is frequently high. The chief of the German veterinary service estimated that the severe outbreaks in 1937-38 in that country cost German farmers £83,000,000.

The Slaughter Policy

(2) The slaughter policy is not peculiar to this country. It is the policy of the U.S.A., the Union of South Africa, Northern Ireland, Eire, Norway and Sweden, and is also followed by Switzerland unless the disease gets beyond control. The countries that "let the disease rip," to use Lord Bledisloe's words, only do so because they are unable to control the disease and not as a deliberate policy. International scientific veterinary opinion very strongly supports a policy of slaughter as opposed to any other method of dealing with outbreaks wherever circumstances render such a policy practicable.

(3) There is always the risk that the disease may get out of hand in this country also. In that case the slaughter policy would have to be abandoned. In the meantime payments by the State in connection with the slaughter policy have averaged just over £100,000 for each of the last 15 years. Can anyone who realises the consequences of the abandonment of the slaughter policy contend that this is an excessive premium to pay against the disease becoming endemic, having regard to the value of the live-stock of the country?

Committee's Report

(4) Early in 1924 a Departmental Committee was set up to consider the very heavy and extensive series of outbreaks of the preceding months and to review and report upon the slaughter policy. After a thorough investigation of the slaughter versus isolation issue, the committee strongly and unanimously recommended the continuance of the slaughter policy.

(5) Informed farming opinion generally wholeheartedly supports the slaughter policy. In a letter on the subject which appeared in a recent issue of one of the leading agricultural journals, the chairman of the Animal Diseases Committee of the National Farmers' Union stated that "slaughter is emphatically the only policy for this country."

Highly Contagious

(6) Foot-and-mouth is probably the most contagious disease known either in veterinary or human medicine, and, contrary to what has been suggested, there is overwhelming evidence that the condition of the animal and of the soil from which it derives its food and the methods of husbandry practised make no difference to its susceptibility to the disease or to its powers of resistance. It is the highly contagious nature of the disease that calls for the utmost rapidity in slaughtering of affected stock, or stock which has been exposed to infection, so as to prevent its spread, since every affected animal remains an active manufacturer of the virus, and owing to its extreme diffusibility there is not the slightest hope of confining an isolation experiment, which has been suggested in one quarter, to any particular part of the country. The reason for this is that infection can be carried mechanically through the medium of persons, birds, rabbits, foxes, etc., or any article which has been in contact with diseased stock.

Losses Since the War

(7) In answer to the contention that the official policy leads to a large and unjustifiable waste of food in war-time, I wish to make it clear that since the outbreak of war only the carcases of diseased animals have been destroyed. Contacts are salvaged for human food. There have been 237 outbreaks of the disease since the beginning of 1940, in the course of which the carcases of 3,098 cattle, 3,139 sheep, and 1,725 pigs have been

destroyed. The remainder of the meat was salvaged for human consumption. The loss of meat and milk to the nation would undoubtedly have been very many times greater if the opponents of the slaughter policy had had their way, and if as a consequence the disease had run riot throughout the country.

(8) Finally, the suggestion that blind adherence to the slaughter policy has led to neglect of research and experiment is devoid of truth. For many years research has been conducted on a substantial scale at a station devoted solely to the problems of foot-and-mouth disease, but, unfortunately, no satisfactory alternative method of coping with the disease has yet been discovered by research in this or any other country.

R. S. Hudson.

Ministry of Agriculture and Fisheries,
S.W.1.

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The Ministry of Agriculture announced on Saturday last that foot-and-mouth disease had been confirmed among cattle at Wilmslow, Cheshire.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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THE CONTROL OF DISEASES OF LIVESTOCK

To the Editor of the Veterinary Record

Sir,—We have all been profoundly impressed by Professor Dalling's recent address and the findings of the Survey Committee, and I feel sure that many of us in looking round our own districts must realise the deplorable state of animal health, and feel that something should be done about it. The question is, however, what and how? In spite of the report of the Survey Committee, one feels a little hesitant about accepting all its findings and recommendations.

Experience has taught the profession that only methods of extreme vigilance, thoroughness and compulsion are likely to achieve very much in the control of contagious diseases, and any scheme possessing these characteristics must of necessity incur, firstly, a considerable amount of expense in administration, and also an initial expense on the part of the stockowner and the country at large.

The Committee have quite realised that neither the individual nor the nation can stand such an expense at the present time, and have, therefore, produced section one of the scheme. One does not wish to appear as a merely destructive critic, but as it is the poor unfortunate practitioner who will be left "holding the baby," it is only fair that practitioners should analyse this scheme carefully and frankly. It is pointed out that the scheme will start on a *voluntary* basis. In other words, a few progressive farmers, who already try to keep their herds healthy, will take it up, and the vast majority will not bother.

And what of the actual recommendations for treatment and control? I venture to think that most practitioners are already applying most of them, and a lot of farmers have been doing their part of it since I was a pupil on a farm before starting at college.

In short, the scheme in its present form means that we shall carry on doing what we are already doing, amongst the same people as we are doing it for now. Let us consider the individual disease.

Mastitis.—While the use of udder infusion and sulphanilamide is very efficient in treating clinical cases, it is doubtful if it produces a bacteriological cure in a high percentage of cases. A quarterly examination seems inadequate to diagnose early cases—which after all become serious in a very few days—and there seems little point in diagnosing sub-clinical cases and carriers, if the prospect of a lasting bacteriological cure is remote. There is some evidence to show that *Strep. agalactiae* is more or less symbiotic, and in the light of our present knowledge it seems that the best we can do is to encourage the farmer to notice clinical cases and have them treated.

Sterility.—It is scarcely feasible regularly to examine all breeding cattle in any district, and little would be gained by doing so, as a very high percentage of cases are due to some functional disturbance which we cannot diagnose by examination, but which often responds to treatment. It is open to question whether uterine irrigation is as good as the simpler treatment by massage. The importance of loss due to this disease appears exaggerated. We usually recommend self-contained herds, and as the size of any herd must be limited there must be some "passing out" rate. If this is done by animals which can be fattened and slaughtered, then the loss is not such as if the animals go as "screws" or die.

Abortion.—The use of calfhood vaccination appears to be the most promising recommendation, but until the Ministry of Health remove their ridiculous restrictions on the use of live vaccine in tuberculin tested herds, one is somewhat hampered. It is pretty useless to try and control abortion in one herd, when it is surrounded by others in which nothing is being done.

Johne's Disease.—Johnin is useful to detect sub-clinical cases, so that animals may be turned to profitable use before being advanced cases, but the test is somewhat costly and is not suitable to be included in a panel scheme.

The report of the Committee has evidently aroused great interest both within the profession and amongst the "powers that be." Therefore, surely the time is ripe for pressing for a more vigorous and thorough scheme. Let it be a State scheme, carried on under the authority of the Ministry, and with the experience and resources of the Animal Health Division. Let it be nation-wide and compulsory, and do not let us risk all by being afraid to tackle the thing properly. The profession can do this, given the proper chance, but woe betide our future if we fail, as we may, by adopting a scheme which is voluntary and not under adequate supervision.

Yours faithfully,
L. Guy Anderson.

49, Cambridge Street,
Aylesbury,
Bucks.
March 3rd, 1941.

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To the Editor of the Veterinary Record

Sir,—Whilst it is doubtful that the Government in these times will be prepared, or able, to give financial assistance to the extent necessary to control the diseases which the Survey Committee of the N.V.M.A. has under review, much could be achieved if the Treasury can be persuaded to give a sufficient grant to the Animal Health Division of the Ministry of Agriculture and Fisheries, to enable it to put a trained bacteriologist at each of its already established and well-equipped divisional laboratories, whose duties would be confined to research and examination of samples of milk, sputum, blood and so on.

Coming to the diseases now under discussion:—

Mastitis.—Without the knowledge of what organism or group of organisms is responsible for an outbreak in a herd, it is not only waste of time, but pure charlatanism to attempt (*a*) prevention, (*b*) control, (*c*) eradication. The present clinical examination is futile unless accompanied by bulk samples from every ten animals examined.

Abortion.—Routine blood testing every six months should be instituted, and where the positives are few, the quickest way to eradicate the disease is to remove them from the herd.

Where this is not possible, other measures must be adopted. It appears to be generally conceded that dead vaccines are of very doubtful value, if any. Other nostrums, making extravagant claims in the lay press, have so far not submitted the data on which these are based to

these columns for investigation, and until they do so, should be ignored.

The living vaccine alone controls, but does not eradicate. Data are required to show: (*a*) the percentage of sterility following its use, (*b*) the inevitable "breaks," (*c*) whether an animal so inoculated is more dangerous, through her milk, to the human subject, than the one which is naturally infected.

Sterility.—The only association with the preceding is entirely dependent on the behaviour of the uterus after abortion. When the foetus and its placental membranes are expelled *in toto*, the uterus rapidly involutes and as a general rule oestrus re-appears in three weeks, to be followed by conception, if service is permitted.

In cases where the placental membranes are not expelled at the time, the percentage of resulting sterility will increase, not due to the *Brucella abortus*, but to the invasion by other organisms, long after the *Brucella abortus* has disappeared from the uterus. The one and only factor responsible for the early expulsion or long retention of these placental membranes is the extent to which the disease has attacked the uterine walls, and it is the non-involution of the uterus due to retention which causes sterility. This is the only connection between abortion and sterility, with the possible exception of that sterility ascribed to the use of a living vaccine, about which satisfactory data are required to arrive at a definite conclusion.

Treatment of all cases of sterility would be more often attended by success if professional advice was sought earlier. Any bovine which fails to "hold" after three services ought to be examined before any further attempt at service. Attention to such cases could be paid quarterly.

But may I issue a word of warning. In cases of endometritis requiring iodine or other uterine injection, adjust the strength to the breed. Guernseys, for example, will not stand the percentage of iodine that a Shorthorn will.

Johne's Disease.—As, in contradistinction to what obtains in tuberculosis, the lesions here are confined to the intestines, there would appear to be no logical reason why a pre-slaughter valuation, unaltered by the *post-mortem* findings, could not be fixed. This will encourage owners to report.

It should, if possible, be appended to the existing Tuberculosis Order and so dispense with testing in doubtful cases to differentiate between the two diseases.

Finally, if we are to set forth to cleanse herds of these diseases, it is obvious that control must be exercised over those found incurable. They should not be permitted to be exposed in any market, auction or fair, but consigned to a recognised slaughterhouse for the fullest possible salvage—for food, or utilisation as by-products. The owner should be assured, at least, of the same recompense as if they had been sold in open market.

The Committee should include diseases of calves, and should recommend the offering of a bonus of ten shillings per carcase, if submitted to, and received by, a recognised laboratory in a fit state to render a satisfactory examination and report possible.

Yours faithfully,

J. F. D. Tutt.

"Rothiemurchus,"
St. Cross,
Winchester.

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To the Editor of the Veterinary Record

Sir,—I recently attended the meeting of the Eastern Counties V.M.A. at Bury St. Edmunds, called to discuss the N.V.M.A. Plan for the Control of Mastitis, Contagious Abortion, Sterility and Johne's Disease. The discussion which ensued at this meeting, together with my realisation of the scope of this proposed scheme, has given me much "food for thought." It is obvious that the profession owes a great debt of gratitude to the Survey Committee for the amount of arduous work, discussion and thought which must have been necessary to compile their very excellent and instructive report.

It now falls upon us as a profession to assist the Survey Committee by free discussion and thoughtful criticism of the proposed plan for the control of the cattle diseases in question. Moreover, realisation of the estimated cost to the nation of these diseases makes it imperative that the profession should immediately sponsor an attempt at their control as part of its national effort in the present emergency.

In an attempt to encourage discussion may I make the following criticisms.

For the successful working of any scheme based on the N.V.M.A.'s plan it would appear that a more healthy liaison must at first exist between the farming community and the veterinary profession. Useful contact could be made between the local branches of the National Farmers' Union and the various Divisions of the N.V.M.A. Such liaison, which has been so lacking in the past, might well form a very useful "stepping-stone" for our future relationship with the agricultural world.

If any general scheme is to be universally adopted by the profession, it is absolutely essential that the scheme be practical, economical and successful in its effect. Expenditure of huge sums of money to the advantage of the profession but with little effect in the eventual control of these diseases, would have a very serious effect on our prestige in the agricultural world and would, moreover, not be consistent with the national effort. It would, therefore, appear important that very thoughtful consideration be given this or any similar plan by the whole profession and that it should be thoroughly agreed that the plan to be adopted has every reasonable possibility of being successful in the long run.

For this purpose the four diseases may be considered individually, but at the same time one should bear in mind that in view of the source of the information contained therein, the report of the Survey Committee must be considered as the most up-to-date available work of reference on the control of these particular diseases.

In general, the recommended methods of control are those which have proved, in varying degrees, to be successful in practice provided that the clinician is willing to persevere and that the client is willing to co-operate with him by the keeping of careful records and the varying of his methods of herd management to meet the circumstances.

In the control of mastitis particular stress is laid on the chronic streptococcal type, but it should not be lost sight of that other types of mastitis are also of economic importance and can often be effectively treated if the clinician is consulted immediately at their onset.

It is noted that particular stress is also laid on the value of sulphanilamide treatment. One wonders, from experience, if the routine treatment of cows infected with streptococcal mastitis will prove as effective as the report would have us believe.

The methods of control of Johne's disease, as outlined in the plan, also appear to need criticism. It would be interesting to hear from practitioners who have managed effectively to control this disease in a herd by means of the intradermal test. The use of johnin may help to reduce the incidence of the disease, but one feels that its routine use will neither completely eliminate the disease from a herd, nor prove as effective in diagnosis as stated in the report. One would suggest that it might be better policy to encourage the Ministry to include Johne's disease in their list of notifiable diseases and to offer the farmer compensation on similar lines to the method adopted in respect of tuberculosis.

Before the adoption of the plan it is therefore necessary for the profession to decide if the methods of control as outlined are likely to prove effective in practice, or, in the words of Mr. Waters, M.R.C.V.S., whether we can "deliver the goods."

If it is agreed that we can, one would offer this further criticism.

Application of the Scheme.—With all due respect to one's colleagues it is obvious that the success of a scheme of this type will also depend upon the proficiency of the clinician. It would appear that a panel of advisory experts, at the beck and call of the clinician, would be a very great asset. At the present moment the Institute of Animal Pathology at Cambridge has a panel of "sterility experts." Similar experts who would specialise in assisting the clinician in the control of any of the four diseases in question could probably be stationed in other parts of the country.

Many of the recommended methods of control depend upon laboratory technique. Opinions vary as to the amount of laboratory work a clinician should be called upon to perform, but every facility must be available for any clinician who, through pressure of work or for other reasons, requires the maximum amount of help in this direction.

Introduction of the Scheme.—The Survey Committee suggests that, to commence with, the scheme should be on a voluntary basis. However unprofessional it may sound, and how little we may like it, the successful introduction of the scheme will therefore depend, unfortunately, upon our "selling" it to the farming community.

Before it can be "sold" it must be "advertised." If a successful liaison occurs between the National Farmers' Union and the various Divisions of the N.V.M.A., the scheme will in many instances be brought to the notice of individual farmers. One feels, however, that unless at that particular moment the farmer in question is experiencing a very serious outbreak of one of the diseases in question, he will take very little notice of it. Individual practitioners may similarly bring the scheme to the notice of the farmer, especially when called upon to treat any of these diseases. There is, of course, no need to emphasise that tact will have to be exercised to ensure that the particular farmer is actually one's client, especially if discussion of the scheme ensues at one's official visit to the farm in the capacity of a local veterinary inspector of the Ministry.

It would appear to me, however, that the greatest obstacle to the scheme is the Survey Committee's suggested fee of 12s. 6d. per dairy animal per herd. When one considers the varying distances between different farms and the practitioner's surgery, the varying sizes of individual herds, and the varying extent of disease in those herds, one universal fee does not appear practicable. One would therefore suggest that the fee chargeable, depending upon the different factors, should be discussed by the practitioner and approved by the organising body of the "panel" scheme.

The introduction of any element of "competition" between adjoining practitioners must of course be carefully avoided and it would therefore appear desirable for the farmer to be enrolled into the Scheme by submission to the N.V.M.A. or other body of an application form in which he would also state who is his veterinary surgeon and the extent of disease in his herd. Such forms could also be kept at veterinary surgeries and distributed by the N.F.U., etc. On receipt of such a form the N.V.M.A. could then contact the veterinary surgeon who would then visit the farm and return a similar form to the N.V.M.A., stating how long he had been the farmer's veterinary surgeon, the distance of the farm from the surgery, and a note of the fee which would be acceptable to him. As a result of this written information, a form of contract could then be signed between the N.V.M.A. and the farmer, whereby it would be agreed that in consideration of the veterinary surgeon carrying out certain duties, the farmer would be agreeable to paying a certain sum per annum.

Control by one organising body appears to be desirable, not only because it is proposed to raise the fees by means of a levy administered by the Milk Marketing Board, but also because an opportunity will be afforded for advertising of the profession as a whole to the farming community without risk of infringement of the bye-laws of the R.C.V.S. by any individuals. Although it is realised that the Survey Committee in evolving this plan has only the interest of the nation at heart, a stimulant to the profession, of the latter type, will be of no ill store.

Yours faithfully,

White House, London Road, King's Lynn. HAROLD C. SWANN.

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THE "NEW" WEYBRIDGE TUBERCULIN

TO THE EDITOR OF THE VETERINARY RECORD

Sir,—All practitioners present at yesterday's meeting of the Royal Counties V.M.A. must have been profoundly interested by the discussion on the "new" Weybridge tuberculin.

Having thought over all that was said both by practitioners (who have to "hold the baby") and by the scientists, who are struggling with this problem, the following conclusions occurred to me:—

(1) From the remarks of practitioners it would seem that both practitioners and farmers are losing faith in the test.

(2) From the observations of Major Dunkin and Mr. Bosworth it is clear that research into tuberculin, both as to manufacture and actions, is as yet a long, long way from being complete.

(3) Either (*a*) The old or pre-Weybridge tuberculin failed to detect many animals infected with tubercle or

(*b*) The "new" or Weybridge tuberculin detects animals which are not infected with tuberculosis.

If the first hypothesis is correct, why is it that animals which have for a number of years passed the test with the pre-Weybridge tuberculin and have subsequently failed with the Weybridge preparation, have not, in the interim, developed some clinical form of tuberculosis?

(4) In view of the fog in which most practitioners, and apparently many Ministry officials, find themselves in attempting to interpret results, is it not farcical for the fate of a herd to stand or fall by the test? In fact, until the scientists have convinced themselves that they have found a really satisfactory method of tuberculin testing should not the test be removed from official standing?

A case was cited at the meeting of a cow giving a slight reaction (so-called doubtful) which was subsequently slaughtered and the only lesion found was a healed lesion in the lung. It is reasonable to assume that that cow was clinically tuberculosis-free and yet its value as a milk-producing animal would be nil pending further tests and retests.

On the other hand, I can recall a case of a cow in good, almost fat, condition, which had in my opinion a clinically tuberculous cough. I reported the animal under the Tuberculosis Order. It was seen by a Ministry official who refused to take it, expressing the opinion that it was not tuberculous and advising the owner to seek my further advice. About three weeks later I had the animal slaughtered and it proved to be the worst case of generalised tuberculosis I have ever seen. It seems illogical, to say the least, that much time and money should be lost over such an animal as cow No. 1, and yet a really dangerous animal like No. 2, which was in all probability secreting tubercle bacilli in the milk and certainly coughing them all over the place, should be dismissed with the most perfunctory examination.

Is it beyond the bounds of possibility to perfect an economic system of co-operation between the laboratories and the clinician whereby the dangerous cow, *i.e.*, the one secreting tuberculosis bacilli in the milk or *via* the respiratory system, can be detected at an earlier stage than appears to be the case at the moment?

In conclusion, it has been said that the aim of argument or discussion is not victory but progress. I failed to see much progress result from this recent meeting and rather than victory there seemed to be an atmosphere very like defeat!

Yours faithfully,

22, Worting Road, Basingstoke. N. ROBERT TURNBULL.

March 1st, 1941.